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Patentanmeldung Nr. Patent application No. Demande de brevet n°

00480047.0

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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
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System and Method for Stock Options Market Management

5 Technical field

10 The present invention relates to the field of stock options market management and more particularly to a method and apparatus for automatically analyzing change of trend of stock option's price evolution.

15 Background art

20 Recognizing patterns in the financial market is a critical resource for today's trader.

25 Stock charting is a technique used to further the investor's understanding of dozens of frequently reoccurring market scenarios. Stock charts are the visual representation of a particular stock or index's price over time. Price is listed
30 on the vertical axis and the time is listed on the horizontal axis. Stock charts may employ mathematical formulas using the historical price data of the stock to generate conclusions
35 about the past price behavior of the stock, and in turn, attempt to anticipate the future price behavior. Stock charts create advantages for technical investors by helping them
40 identify the underlying trend or pattern that is moving the price up or down. Chart patterns illustrate reoccurring situations that face investors every trading day.

45 Japanese candlestick charting is one of these techniques used to forecast price behavior. A candlestick chart is a group of
50 candlesticks in chronological order. A candlestick is represented with two parts, the "body" and the "tails" (also called "shadows"). The difference between the open and close
55 prices of a time period makes a box which is call the body. If the body is filled in, the stock price has gone down during that time period, whereby the top of body is the open price

and the bottom of the body is the close price. If the body is not filled in, the stock price has gone up during that time period, whereby the bottom of the body is the open and the top
5 of the body is the close. If the stock price did not change, a horizontal line will represent the body. The "tails", or vertical lines, extending from the body indicate the high and
10 low prices during that time period.

For more in-depth coverage on charting techniques, refer to
15 'Japanese Candlestick Charting Techniques' from Steven Nison.

It is also known to combine the technical indicators of the
20 charting techniques with a technical analysis to enhance the studying of the shape and movement of a stock chart. However, with the existing solutions, generally the individuals must
25 use their own professional experience to understand which sequential indicators are characteristic of some events such as a change of trend of the price.

30 The present invention is directed towards a system and method which automatically offers to the user such understanding.

35 **Summary of the invention**

40 In accordance with the invention, there is provided a method for analyzing the characteristics of sub-time periods of a time period over which a change of trend of price evolution of
45 a plurality of stock options occurs. The method comprises the steps of:

(a) on each sub-time period, aggregating the data associated
50 to each stock option by creating a standard description of the stock option's price;

(b) on each sub-time period, converting the standard
55 description of each stock option into a candlestick pattern chosen among a predetermined typology of a plurality of candlestick patterns;

(c) for each sub-time period and for each stock option, comparing the standard description of the current sub-time period to the standard description of the previous sub-time period, and allocating a comparison code, the comparison code being chosen among a predetermined typology of a plurality of comparison codes;

(d) using each standard description created on step (a) for marking each sub-time period of each stock option with a trend indicator; and

(e) applying an exploratory data analysis method on the results obtained on steps (b), (c) and (d) for each stock option to determine a set of characteristics of the sub-time periods for the plurality of stock options.

Also in accordance with the present invention, a system for analyzing the characteristics of sub-time periods of a time period over which a change of trend of a price evolution of a plurality of stock options occurs is disclosed. The system comprises means for storing data being representative of the price evolution of the plurality of stock options and means for aggregating the data associated to each stock option and for creating for each stock option a standard description of the stock option's price on each sub-time period. Each standard description generated is converted into a candlestick pattern being chosen among a predetermined typology of a plurality of candlestick patterns. For each stock option, each standard description of a current sub-time period is also compared to the standard description of a previous sub-time period, and a comparison code being chosen among a predetermined typology of a plurality of comparison codes is allocated to each comparison. The system further comprises means for marking each sub-time period of each stock option with a trend indicator using each standard description and finally the output of the converting means, the output of the comparing means and the output of the marking means are merged

within merging means to generate a set of characteristics of the sub-time periods for the plurality of stock options.

5 Preferably, the means for generating the set of characteristics operates an exploratory data analysis method.

10 In a commercial application, stock option's historical data are collected at five minutes intervals during one year. The observation's sub-time periods are a 'one opening day stock
15 exchange'. The stock options prices are aggregated into a set of four values (the by-day standard description) representing the day open price, the day close price, the day low price and
20 the day high price. After the method is processed according to the aforementioned steps, the characteristic days are highlighted as a beginning-up day meaning that a rising price
25 period is starting or as a beginning-down day meaning that a decreasing price period is starting.

30 **Brief description of the drawings**

Fig.1 shows a block diagram of a typical digital computer
35 utilized by a preferred embodiment of the invention.

Fig.2 is a flowchart showing the overall operation of a
40 preferred embodiment of the present invention.

Fig.3 is a table representation to illustrate the process of
45 figure 2.

Fig.4 is a flowchart showing the steps for generating the
50 candlestick description.

Fig.5 is a flowchart showing the steps for comparing two
55 standard descriptions.

Fig.6 is a flowchart showing the steps of the preferred method to mark the price evolution curve with up and down indicators.

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Detailed description of the invention

10 Referring now to the drawings, figure 1 illustrates an environment in which a preferred embodiment of the present invention operates. A computer platform 100 includes hardware units 102, including one or more Central Processing Unit (CPU) 104, a Random Access Memory (RAM) 106, and an input/output (I/O) interface 108. The computer platform 100 runs with an operating system 110, and may include micro instruction code 112. A data base management system 114 may be part of the micro instruction code 112 or an application program to be executed via the operating system. Historical data may be stored in any kind of local or remote data storage 116. Remote data storage may be accessible through modems and communication lines (not shown). The data may be collected from various sources and media such as written information, experts evaluations, or in-house historical. Various peripheral units 118 like terminals, disks, or scanners may be connected to the computer platform 100 for inputting the data. The computer platform 100 could be a server terminal connected to multiple clients CPU. A user or an actor wishing to process the method of the invention would access the system through the I/O interface 108. The I/O interface circuit could be as well a remote terminal with Internet like connection. Output results could be available on peripheral units 118 or as a data file in the data storage 116 or on a printer device 120.

50 Referring to Fig. 2, the overall process 200 of the invention is detailed for a preferred application. For better understanding of the process, reference is also made to figure 3 which is an illustration in the form of database tables of such process.

On a first step 202 of figure 2 and associated table 302 of figure 3, the information relative to a stock option (denoted 'A' on figure 3) is collected at regular intervals (column 'snapshot' on figure 3). The interval in the present example is 5 minutes. For clarity of the description, the process is described for only one stock option but it is obvious that it applies to a stock option portfolio comprises several hundred stock options.

Preferably the information collected is the stock option price (column 'current price' of figure 3) at the current snapshot. The time period collection may be sufficiently long to reveal changes of trend in the price evolution, such as several weeks or months. The present application has been elaborated for a one year time period data collection.

On next step 204, the stock option price is aggregated by day into a standard description which reflect the price variation within the day. The description preferably comprises the values of the open price, the close price, the low price during the day and the high price during the day. It may also includes other values such as the mean price.

Table 304 illustrates the aggregation operation for stock 'A' over 3 days. On first line of stock 'A', the four right columns contain the standard description values (Day Open Price, Day Close Price, Day Low Price, Day High Price) for a first day (1st January 2000). Similarly, on second line, the standard description values of stock 'A' are stored on the last right columns for a second day (2nd January 2000).

Step 206 is the operation which allows to describe the by-day standard description of each stock by a candlestick pattern. As can be seen on table 306, a code 'KL' (denoted 'KeyLine' on the right column of table 306) is attributed to each standard description of stock option 'A'. As it will be fully explained

later with reference to figure 4, the code 'KL' is chosen from a predetermined candlestick typology including 'well-known' candlestick patterns and specific ones.

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The by-day standard description of stock option 'A' for January 1st, 2000 is associated to a 'KL1' code which corresponds to the black candlestick pattern illustrated on left side under table 306. The 'KL1' code is a pattern for which the close price is lower than the open price and for which the close price corresponds to the low price and the open price corresponds to the high price.

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Similarly, the by-day standard description of stock option 'A' for January 2nd, 2000 is associated to a 'KL3' code which corresponds to the second left candlestick pattern illustrated on left side under table 306. The 'KL3' code is a pattern for which the close price is lower than the open price, with the close price equal to the low price, while a high price is higher than the open price (the shaven bottom in the common candlestick terminology).

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Finally, third day of stock option 'A' is exemplified with a 'KL8' candlestick code (the white candlestick in the common candlestick terminology).

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Step 208 is the operation which allows to have a positioning of the current day standard description of each stock against the previous day standard description. As can be seen on table 308, a code 'KD' (denoted 'KeyDelt' on the right column of table 308) is attributed to each standard description of stock option 'A'. As it will be fully explained later with reference to figure 5, the code 'KD' is chosen from a typology grouping the different relative positions of a current day vs. a previous day.

The by-day standard description of stock option 'A' for January 2nd, 2000 is associated to a 'KD +2' code which reflects the fact that the average price is significantly
5 higher than the average price of the previous day January 1st, 2000.

10 Similarly, the by-day standard description of stock option 'A' for January 3rd, 2000 is associated to a 'KD +1' code which reflects the fact that the average price is a little bit
15 higher than the average price of the previous day January 2nd, 2000.

20 Going to step 210, each by-day standard description of stock 'A' is resumed by a unique value which may be for example computed as being the price average or the half price between
25 open and close prices. The resumed value is useful as will be explained later with reference to figure 6 to detect the type of trend of the price evolution for each day.

30 Third column of table 310 on figure 3 illustrates the type of trend for stock option 'A' over three days. For example, on
35 January 1st, 2000 the price evolution leads to a 'Beg_UP' mark which points to a beginning of a rising trend for the next days. On the second line, the price evolution of stock option
40 'A' during January 2nd, 2000 is marked as an 'UP' type evolution.

45 Next, the indicators created on steps 206, 208 and 210 are operated on step 212 by a common exploratory data analysis method to obtain a set of characteristics of the different
50 kinds of marks.

The characteristics issued from step 212 may be available to the user either on a display unit 118 or as a data file 116 or
55 on any output device such as a printer 120.

5 The person skilled in the art will readily understand that
according to the analysis method, these characteristics may be
available from a curve clustering to show which type of curves
precedes a 'Beg_Up' or a 'Beg_Down' marked day, or may be
available from candlestick associations to determine what
groups of candlesticks are present before a 'Beg_Up' or a
10 'Beg_Down' marked day, or also may be available from other
well-known data analysis methods.

15 Referring now to Fig. 4, a detailed flowchart of the process
of step 206 is explained. From block 402 to 404, the
parameters open, close, low and high of the by-day standard
20 description are converted into commonly used elements to
construct the candlestick patterns and generally called
'upper_shadow, lower_shadow, body and type'. The body
25 represents the range between the open and close price. The
upper_shadow/lower_shadow represent the high/low price
extremes for the day.

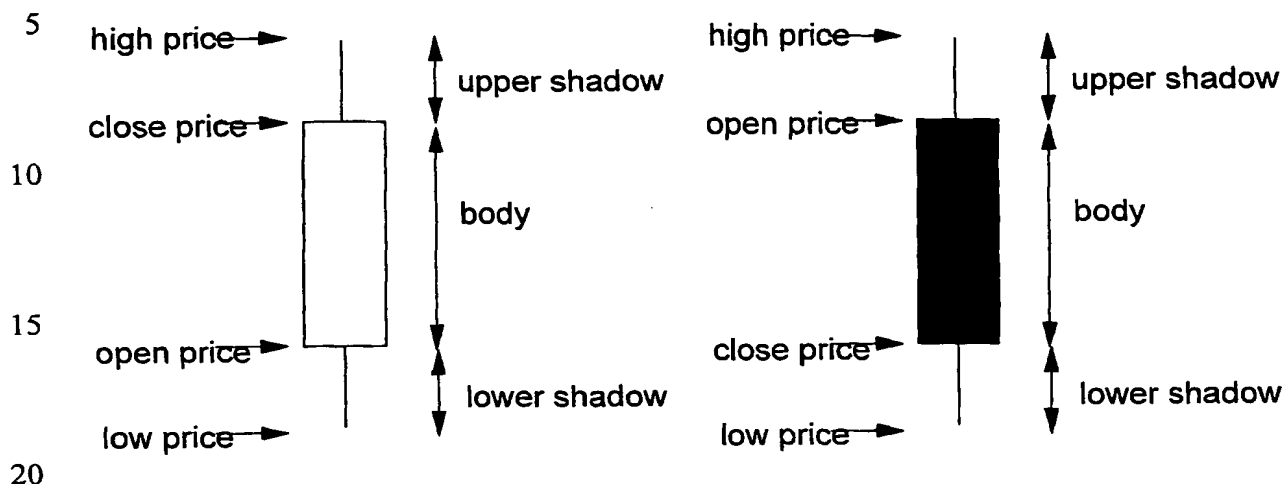
30 The type may be white or black. A white body means that the
close price is higher than the open price, while a black body
35 means that the close price is lower than the open price. Thus
the relationship between the day's open, high, low, and close
price determine the look of the daily candlestick pattern.
40 Body can be long or short and white or black. Shadows can be
long or short as well. Thus, the day's price of a stock option
may be represented by a specific candlestick pattern. The

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illustrations below show a white body pattern in left and a black body pattern in right.



Next on block 406, the body, the upper_shadow and the lower_shadow parameters are discretized. For example, the upper_shadow can be discretized into five values such as a first value when the upper_shadow is in the range of 0 to 5% of the total length of the candlestick (high - low). A second value may correspond to a range of 5 to 45%, a third value for a range of 45 to 55%, a fourth value for a range of 55 to 95% and a fifth value for the range of 95 to 100%. However, this is only an example and any other discretization could be used.

The discretization operation allows to reduce the infinite number of possible candlestick descriptions previously available on step 404 to a finite number.

The last step 408 consists in mapping the finite number of candlestick descriptions to a predetermined candlestick typology wherein each pattern is represented by a keyline code 'KL'.

Referring to figure 5, starting from the standard description on block 502, characteristic values of the current day's price evolution are computed on step 504 in order to accomplish the positioning operation of step 508. In a

preferred embodiment, three values are used. The first is the minimum price 'min' of the open and close price values. The second is the maximum price 'max' of the open and close price values. And the third value is the centre price 'centre' which is the half between the open and close price values. Obviously, a different number of characteristic values could be used depending on the accuracy required for the positioning typology as illustrated on block 510.

Similar characteristic values are computed for the previous day on step 506. As already explained, step 508 compares the current and previous set of characteristic values and maps the comparison to a predetermined comparison typology having keydelt codes 'KD' representing the relative positioning. For example, 'KD-3' keydelt code is assigned when the maximum of the current day is less than the minimum of the previous day as shown on the second left column of block 510.

Figure 6 shows one preferred method to mark the price evolution curve with up and down indicators. Starting from the standard description on block 602, one characteristic value of the day's price is computed. This value may be the centre value 'centre' already selected for the process of blocks 504/506, or an average value or a median value or any other value suitable to be representative of one day's price. Each computed value is smoothed on step 604 regarding the previous and the next day computed values.

On step 606, a difference between the current day's value and the previous day's value is computed which may be expressed as an absolute term or as a relative one.

The differences are discretized on step 608 resulting in a limited number of values called 'key slope' hereinafter representing these differences. In the preferred embodiment, five values are used: the 'high decreasing', the 'medium

decreasing', the 'flat', the 'medium increasing' and the 'high increasing'.

5 On step 610, for each day, the number of each different key slopes appearing over a time window of the next days is counted. If a short term view is explored, the window size is
10 preferably seven days for example, and if a long term view is explored, the window is preferably thirty days. It is to be understood that other day counting could be adapted to count
15 the key slopes such as a simultaneous counting over several time windows.

20 On step 612, the result of the preceding count is used to mark each day as an 'up' or a 'down' or 'flat' day based on heuristic marking rules. For example, a day is marked as 'up'
25 if in the count of the seven next days there is no decreasing key slope (zero 'high decreasing' and zero 'medium decreasing'), and at least four increasing key slopes (either
30 'high increasing' or 'medium increasing') including at least one 'high increasing' key slope.

35 The last step 614 determines among the marked days which are to be marked as being a beginning up 'Beg_up' or beginning down 'Beg_down' day by applying heuristic marking rules in the
40 same way as in previous step 612. For example, a day is marked 'Beg_down' if it is the first day of a marked 'down' series but also if no marked 'down' day appears in the previous seven
45 days.

It is obvious for the skill man that such marking could be
50 realised using any other method, such as a regression method.

While the invention has been particularly shown and described
55 with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various change in

form and details may be made without departing from the spirit
and scope of the invention.

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Claims

- 5 1. In a data processing system comprising a processor and
data storage means for storing data representative of the
price evolution of a plurality of stock options over a time
10 period, a method for analyzing the characteristics of sub-time
periods of the time period where a change of trend of the
price evolution occurs, the method comprising the steps of:
- 15 a. on each sub-time period, aggregating the data
associated to each stock option by creating a
standard description of the stock option's price;
- 20 b. on each sub-time period, converting the standard
description of each stock option into a candlestick
pattern chosen among a predetermined typology of a
25 plurality of candlestick patterns;
- c. for each sub-time period and for each stock option,
30 comparing the standard description of the current
sub-time period to the standard description of the
previous sub-time period, and allocating a
comparison code, the comparison code being chosen
35 among a predetermined typology of a plurality of
comparison codes;
- d. using each standard description created on step (a)
40 for marking each sub-time period of each stock
option with a trend indicator; and
- e. applying an exploratory data analysis method on the
45 results obtained on steps (b), (c) and (d) for each
stock option to determine a set of characteristics
of the sub-time periods for the plurality of stock
50 options.
2. The method of claim 1 further comprising a first step
55 before step (a) of collecting data at regular time intervals
over the time period.

3. The method of claims 1 or 2 wherein the standard
5 description comprises a set of price values (open, close, low,
high) describing the price evolution of each stock option
within the sub-time period.
- 10 4. The method of anyone of claims 1 to 3 wherein the
sub-time period is one day.
- 15 5. The method of anyone of claims 1 to 4 wherein steps (b),
(c) and (d) are processed simultaneously.
- 20 6. The method of anyone of claims 1 to 5 wherein step (d) is
processed using a regression analysis method.
- 25 7. The method of anyone of claims 1 to 6 wherein step (d) is
processed using an image analysis detection method.
- 30 8. The method of anyone of claims 1 to 7 wherein the data
collected are representative of an evolutive parameter other
35 than the stock option's price.
9. A system for analyzing the characteristics of sub-time
40 periods of a time period over which a change of trend of a
price evolution of a plurality of stock options occurs,
comprising:
- 45 • means for storing the data being representative of the
price evolution of the plurality of stock options,
 - means for aggregating the data associated to each stock
50 option and for creating for each stock option a standard
description of the stock option's price on each sub-time
period,
 - 55 • means for converting each standard description into a
candlestick pattern being chosen among a predetermined
typology of a plurality of candlestick patterns,

- means for comparing the standard description of each stock option over a current sub-time period to the standard description of the respective stock option over the previous sub-time period, and allocating a comparison code, the comparison code being chosen among a predetermined typology of a plurality of comparison codes,
- means for marking each sub-time period with a trend indicator using the standard description of each stock option, and
- means for merging the output of the converting means, the output of the comparing means and the output marking means, to generate a set of characteristics of the sub-time periods for the plurality of stock options.

10. A system according to claim 9 wherein the means for generating the set of characteristics further comprising means for operating an exploratory data analysis method.

11. A system according to claim 9 or 10 further comprising means for collecting the data being representative of the price evolution of the plurality of stock options at regular time intervals over the time period.

12. The system according to anyone of claims 9 to 11 further comprising means for simultaneously operating the converting means, the comparing means and the marking means.

13. The system according to anyone of claims 9 to 12 wherein the data collected are representative of an evolutive parameter other than the stock option's price.

14. In a data processing system comprising data storage means for storing historical data representative of the price evolution of a plurality of stock options over a time period,

a computer program product comprising a program configured to perform a method for automatically analyzing characteristics of sub-time periods of the time period where a change of trend
5 of price evolution occurs, the method comprising the steps as set forth in anyone of claims 1 to 8.

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Abstract**System and Method for Stock Options Market Management**

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10 A system and method for analyzing the characteristics of
sub-time periods of a time period over which a change of trend
of a price evolution of a plurality of stock options occurs is
disclosed. The system comprises means for storing data being
15 representative of the price evolution of the plurality of
stock options and means for aggregating the data associated
to each stock option and for creating for each stock option a
20 standard description of the stock option's price on each
sub-time period. Each standard description generated is
converted into a candlestick pattern being chosen among a
25 predetermined typology of a plurality of candlestick patterns.
For each stock option, each standard description of a current
sub-time period is also compared to the standard description
30 of a previous sub-time period, and a comparison code being
chosen among a predetermined typology of a plurality of
comparison codes is allocated to each comparison. The system
35 further comprises means for marking each sub-time period of
each stock option with a trend indicator using each standard
description and finally the output of the converting means,
40 the output of the comparing means and the output of the
marking means are merged within merging means to generate a
set of characteristics of the sub-time periods for the
45 plurality of stock options.

50 **Fig. 2**

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FIG. 1

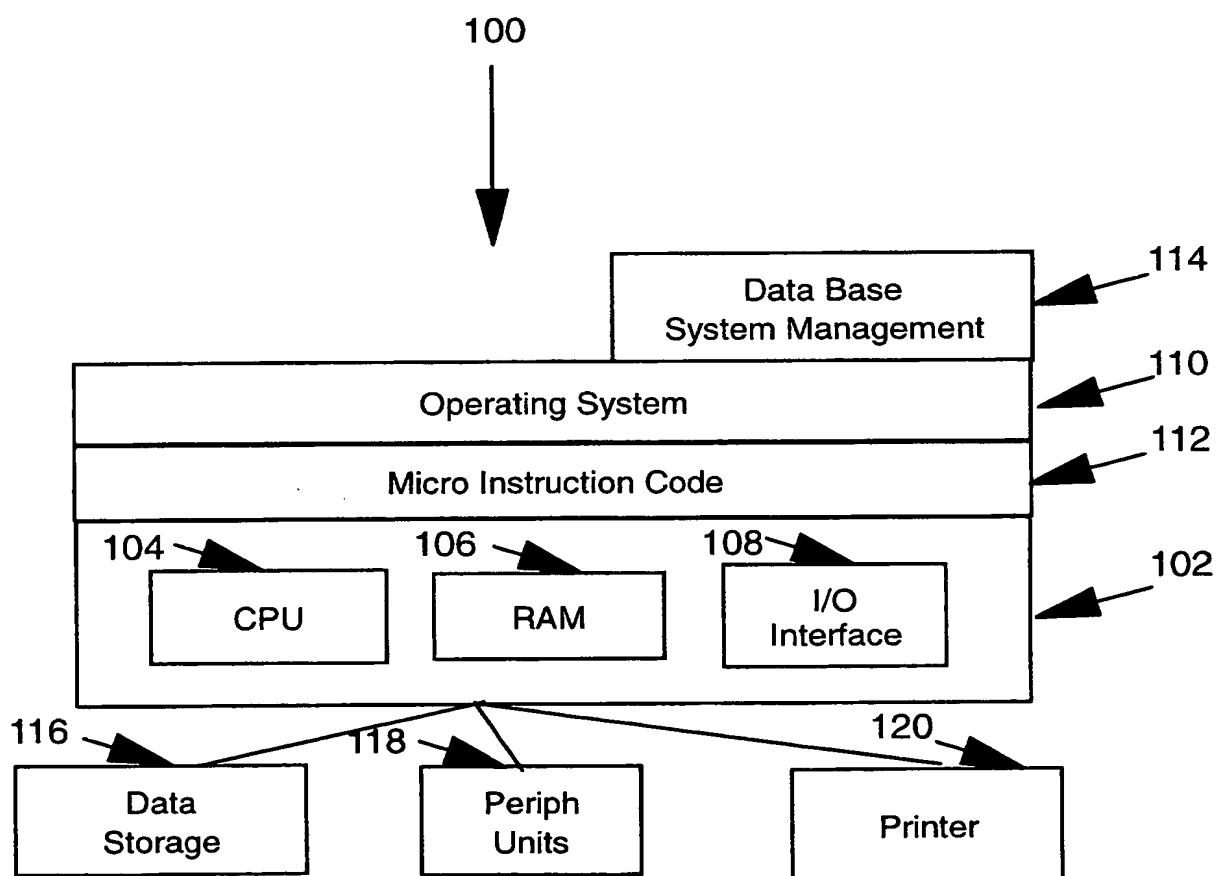


FIG. 2

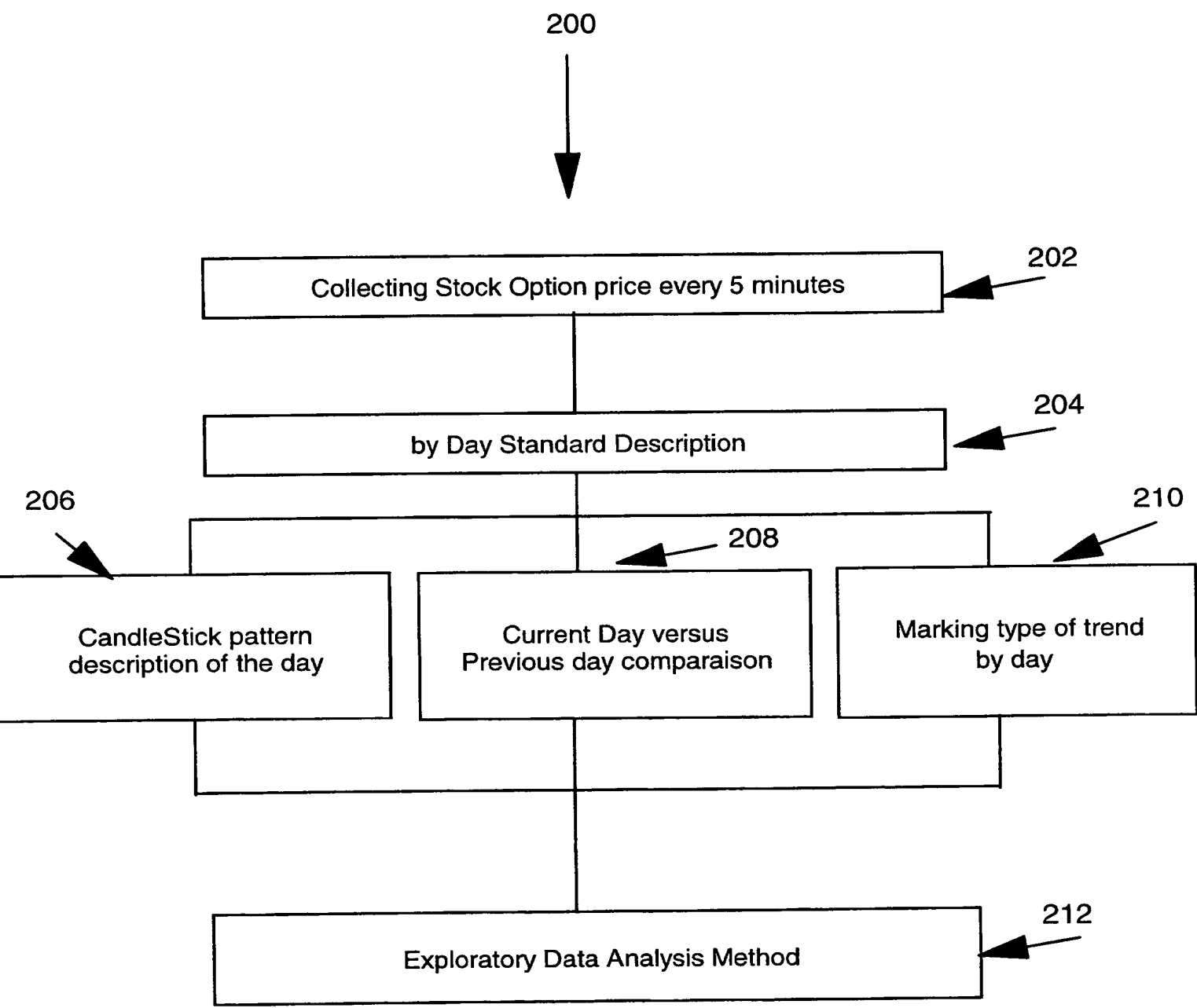


FIG. 3

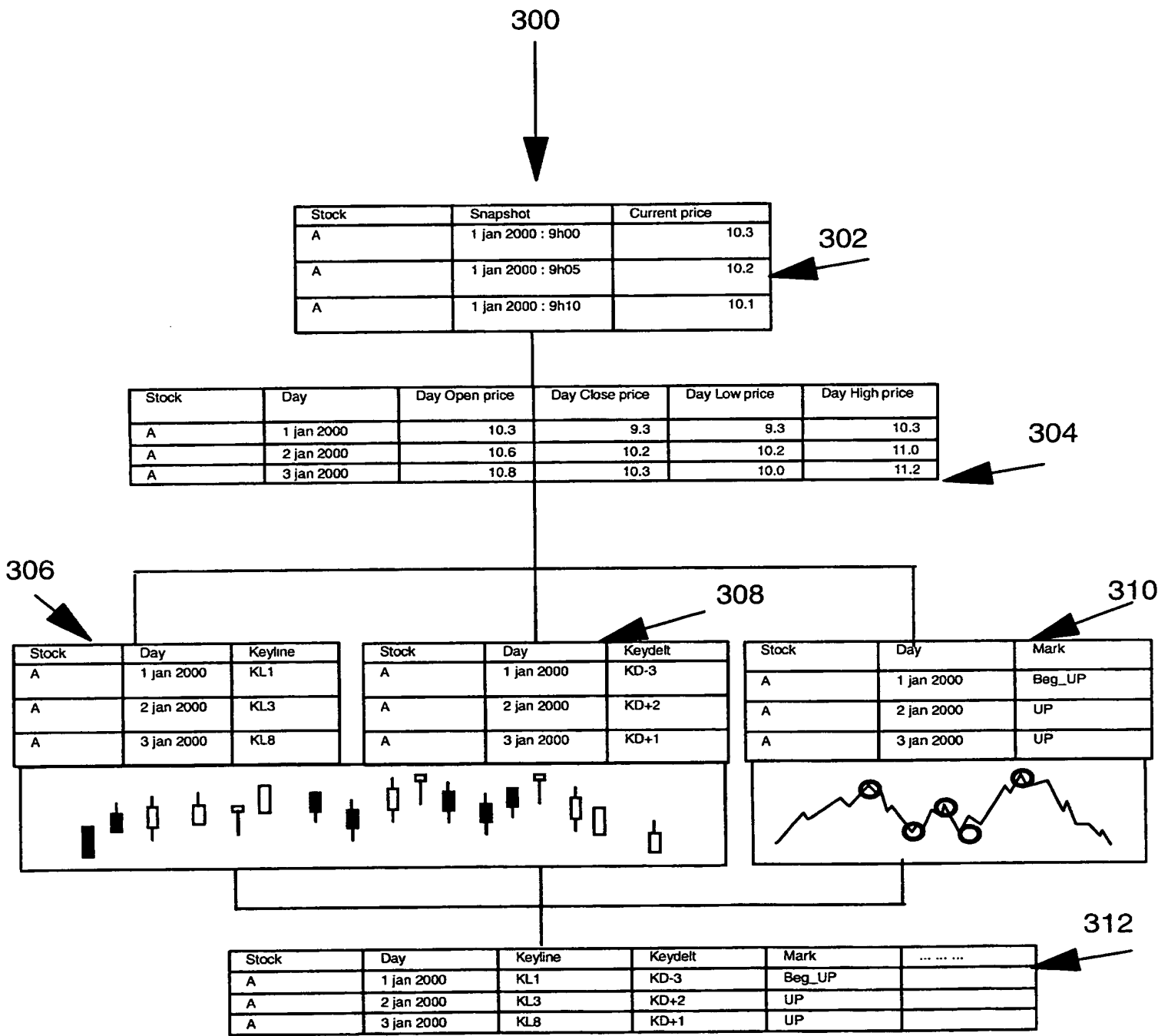
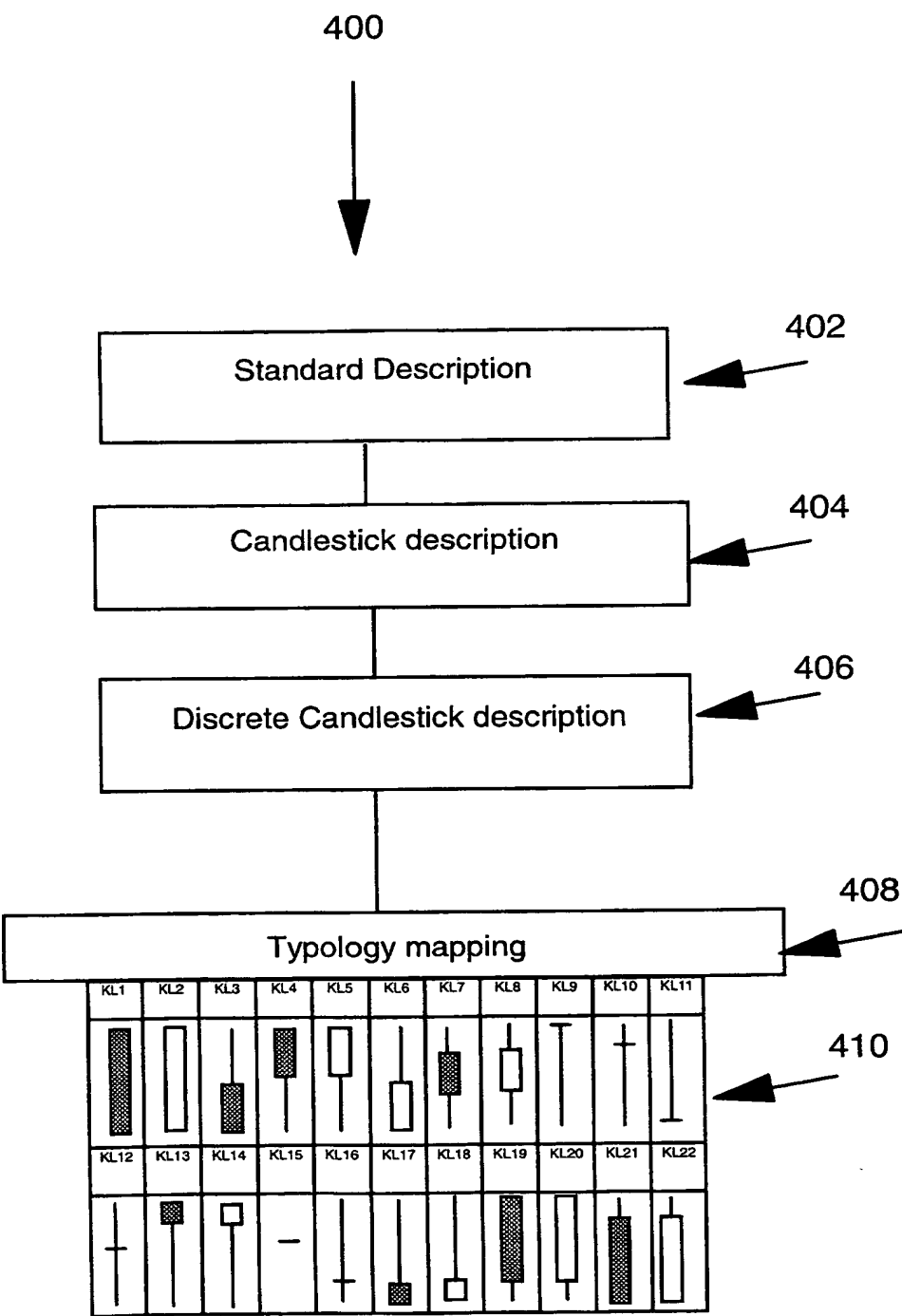


FIG. 4



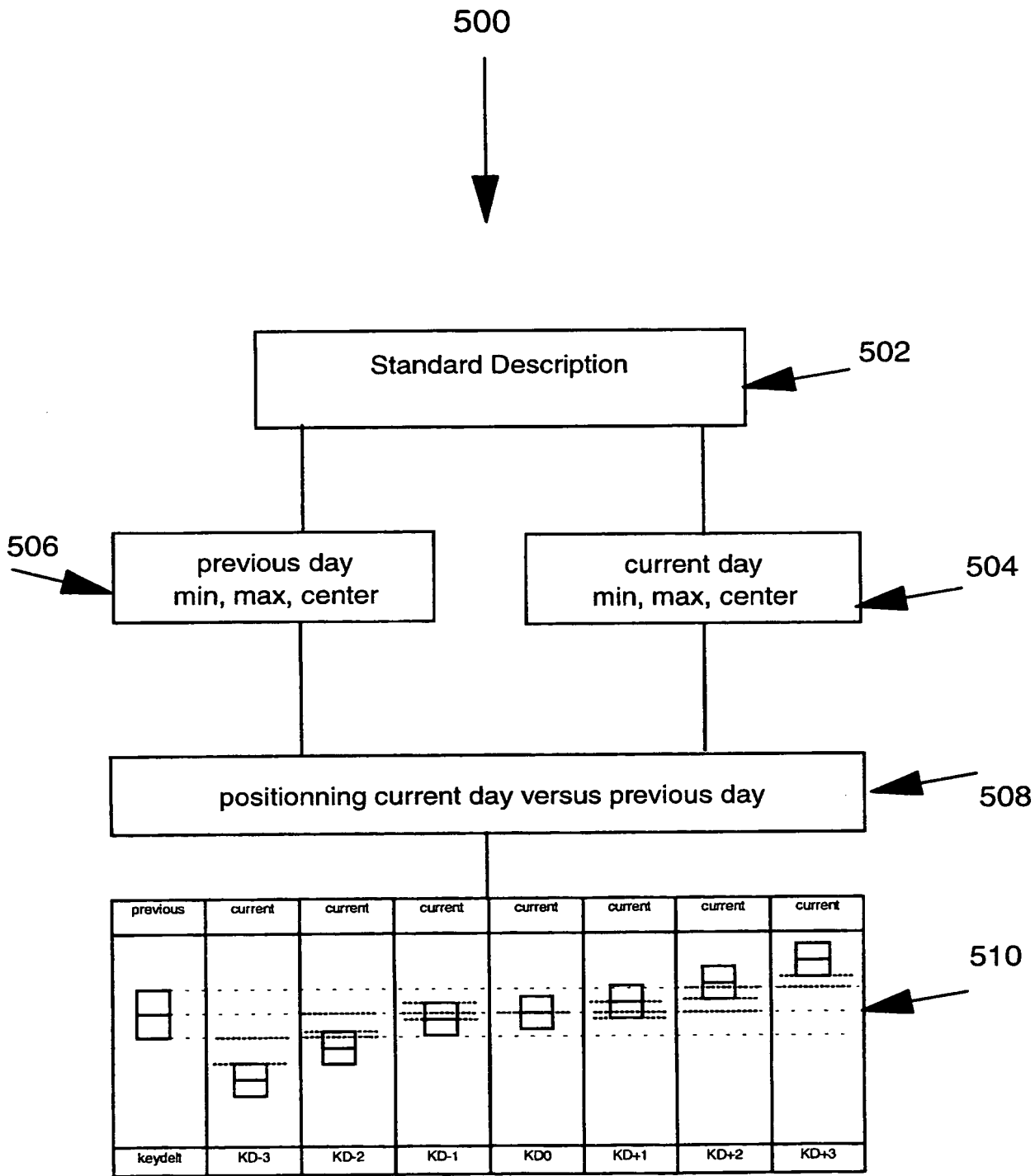


FIG. 6

